

REMARKS

In response to the Office Action mailed January 25, 2005, Applicants respectfully request reconsideration in light of the foregoing amendments to the claims and the following remarks, and the attached two month request for extension of time to respond.

Claims 1 to 12 are presented for reconsideration.

Claim 10 stands rejected under 35 USC §102(b) as being anticipated by DeMarco (US Pat. No. 3,507,127). The Examiner contends that DeMarco shows a system for removing a nitrogen stream from a predominantly methane stream to provide a purer methane stream 20 and a nitrogen enriched stream 24 which then passes through lines 26, 28 and 38. Reference numeral 2 refers to a conduit which places the nitrogen enriched stream in communication with the feed natural gas pipeline.

Applicants contend that the invention as now claimed in claim 10 is not anticipated by DeMarco. Applicants' invention is an apparatus for rejecting nitrogen from a feed gas stream which comprises methane and nitrogen. The apparatus comprises a feed natural gas pipeline for obtaining the feed gas stream from a source of a mixture of nitrogen and methane whose nitrogen mole fraction can increase with the passage of time; a main heat exchanger for cooling the feed natural gas stream in communication with the feed natural gas pipeline; a rectification column for rectifying the cooled feed natural gas stream having first outlet for a primary product methane stream and a second outlet for a secondary nitrogen-enriched product stream, a first product pipeline communication with the first outlet and a second product pipeline communication with the second outlet wherein the apparatus additionally comprises a conduit able to be selectively opened so as to place the second product pipeline in communication with the feed natural gas pipeline,

whereby a part of the feed gas stream is able to flow into said nitrogen-enriched product stream to restore its mole fraction of methane to a chosen minimum value or higher.

Each and every element of Applicants' claimed invention is not shown in DeMarco. DeMarco teaches that the flow of gas is that of the secondary product gas into the fresh feed of gas, please note column 2, lines 53 to 56. Applicants claim that the flow of the fresh feed is diverted into a secondary nitrogen-enriched product stream. Further distinguishing Applicants' invention from DeMarco is that DeMarco purifies a stream of nitrogen gas that contains impurities such as methane. Applicants are purifying a methane gas stream that contains some nitrogen. Claim 10 describes both a first outlet for a primary product methane stream and a second outlet for a secondary nitrogen-enriched product stream. The DeMarco reference teaches a secondary product gas stream flow into the fresh feed, which is the opposite of what Applicants claim. The second product pipeline is connected by a conduit to the feed natural gas pipeline. The conduit can be selectively opened to allow feed gas to flow into the nitrogen-enriched product stream. Reconsideration and reversal of this rejection are respectfully requested.

Claims 1, 6, 7, 10 and 11 stand rejected under 35 USC §102(b) as being anticipated by Forg et al. (US Pat. No. 3,721,099). The Examiner contends that Forg et al. teaches a system for removing a nitrogen enriched stream from the top of a double rectification column, 35, 29, and a liquid, enriched methane stream from the bottom of the column. Valve 42a, as discussed in lines 42 to 57 of column 5 allows feed from line 1 to be mixed with the exiting nitrogen enriched stream to conserve a desired minimum methane concentration. In regard to claim 7, the vapor is raised in pressure by compressor 41.

Applicants contend that their invention is not anticipated by the teaching of Forg et al. The present invention relates to a method of rejecting nitrogen from a natural gas stream. The nitrogen is rejected by rectifying the natural gas. A primary product enriched in methane is thereby produced while a secondary product, enriched in

nitrogen is also formed. The secondary product is taken from the top of the rectification column 24 in the Figure. This product normally contains enough methane to make it combustible. The source of natural gas however is sometimes an oil gas field in which nitrogen is used to enhance recovery. As time passes, the feed natural gas stream becomes enriched in nitrogen. As a result, the nitrogen content of the secondary product increases with consequent difficulties in burning it. The present invention diverts a part of the natural gas feed gas into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to at least a minimum value.

Forg et al. does not disclose each and every element of the invention claimed in 1, 6, 7, 10 and 11. The Examiner has directed Applicants' attention to the valve 42a in Fig. 2. Applicants respectfully disagree with the Examiner's interpretation of this Figure. The flow of gas through this valve 42a is not from the natural gas flowing through the conduit 1 to the conduit 40a but instead from the gas mixture of nitrogen and methane flowing in the conduit 40a into the natural gas in conduit 1. This reference does not disclose that a part of the natural gas feed gas is introduced into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to the chosen minimum value or a value thereabove.

The direction of flow through the valve 42a is evident from the specification at lines 54 to 58 of column. It can be inferred that the previously condensed hydrocarbons pass through the valve 42a that the direction of flow through this valve has to be into the fresh feed (i.e. from the conduit 40a to the conduit 1) because if the flow were in the other direction it would not be of a fluid comprising higher boiling hydrocarbons previously condensed during the course of the pre-cooling step.

Since each and every element of Applicants' claimed invention is not shown in Forg et al., it does not render the claimed invention anticipated. Reconsideration and reversal of this rejection are respectfully requested.

Claims 2, 3, 8 and 9 stand rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of Butts. The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention from the teaching of Butts to modify the separation system of Forg et al. by using a Joule-Thomson valve to provide the refrigeration for the separation to provide cooling due to rapid expansion which will assist in the separation process by cooling the rapidly expanding gas to promote condensation of the less volatile constituent.

Applicants contend that the invention as claimed in claims 2, 3, 8 and 9 is not obvious over the combination of Forg et al. in view of Butts. As submitted above, Forg et al. does not show each and every element of the claimed invention. On the contrary, Forg et al. does not teach that a portion of the feed gas is introduced into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to the chosen minimum value or a value thereabove. The valve 42a is employed to allow previously condensed hydrocarbons to pass through into the fresh natural gas feed from the conduit 40a.

Forg et al. relies on the fractional condensation of hydrocarbons to provide refrigeration and does not suggest looking to a reference using a Joule-Thomson valve to provide the same. Butts provides cooling and pressure reduction to achieve optimum nitrogen and hydrocarbon separation within the separator column by use of a Joule-Thomson valve and primarily relies on heat exchangers once steady state operation is achieved to achieve this cooling.

Since Forg et al. does not teach or suggest Applicants' claimed invention, there is no incentive to utilize a Joule-Thomson valve to achieve cooling per the teachings of Butts. Reconsideration and reversal of this rejection are respectfully requested.

Claim 4 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of DeMarco. The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention from the teaching of

DeMarco to modify the separation system of Forg et al. by using an expansion engine to provide the refrigeration for the separation to provide cooling for the system while recovering work.

Applicants contend that their invention as claimed in claim 4 is not obvious over the combined teachings of Forg et al. and DeMarco. Applicants maintain that Forg et al. neither identically discloses nor teaches their invention particularly as to diverting a part of the feed gas into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to at least a minimum value.

As such, there is no incentive for Applicants to look to another reference for cooling means as DeMarco as well does not teach or suggest their invention. Although DeMarco shows the use of an expansion engine to provide refrigeration, this reference too fails to teach or identically disclose Applicants' claimed invention. There would be no reason for Applicants to combine two different processes to realize that expansion engines will provide refrigeration in their nitrogen rejection method. Reconsideration and reversal of this rejection are respectfully requested.

Claim 5 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of Butts as applied to claims 2, 3, 8 and 9 above and further in view of DeMarco. The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention from the teaching of DeMarco to modify the separation system of Forg et al. by using an expansion engine to provide the refrigeration for the separation to provide cooling for the system while recovering work.

Applicants submit that their invention as claimed in claim 5 is not obvious over the teachings of Forg et al. in view of Butts and further in view of DeMarco. Applicants contend that both DeMarco and Forg et al. fail to teach or disclose the invention as claimed. Accordingly, they would not look to either of these references for their source of refrigeration, nor would they then look further to combine them with a third reference, in Butts to derive their invention. The choice of two refrigeration methods of claim 5 is

not taught by this combination of references. Reconsideration and reversal of this rejection are respectfully requested.

Claim 12 stands rejected under 35 USC §103(a) as being unpatentable over Forg et al. in view of McNeil et al. The Examiner submits that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention from the teaching of McNeil et al. to modify the separation system of Forg et al. by using a pump to remove the liquid product from the column to provide high pressure product.

The invention as claimed in claim 12 is not obvious over the combination of Forg et al. in view of McNeil et al. As Applicants have contended above, Forg et al. fails to identically disclose the claimed invention as this reference does not disclose that a part of the natural gas feed stream is introduced into the secondary nitrogen-enriched product stream so as to restore its mole fraction of methane to the chosen minimum value or a value thereabove.

This is a different process from what is claimed by Applicants who utilize the pump as claimed in claim 12 in conjunction with their rejection process for withdrawing the primary product stream (methane) from the lower pressure rectification column and for raising the primary product methane stream pressure. McNeil et al. teaches that the bottoms from the column 10 are carbon dioxide and heavy hydrocarbons and are recovered in line 14. This joins in with line 35 which is primarily methane, which is then cooled in subcooler 13, then pumped via pump 36 into a main heat exchanger 2 and delivered via line 37 to be mixed with the compressed methane for use as a product sales gas.

Because Applicants achieve their result in a manner different from Forg et al., there is no motivation to look to McNeil et al. for a pump that can be used to increase the pressure of the product gas. This is not sufficient to obviate the claimed invention. reconsideration and reversal of this rejection are respectfully requested.

The prior art made of record and not relied upon has not been discussed as it is considered less relevant than that art relied upon. For these reasons, Applicants respectfully submit that their invention as claimed defines patentable subject matter and is in condition for allowance.

The Examiner is invited to call the undersigned should any issue arise during the reconsideration of this application.

Respectfully submitted,

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Enclosure

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